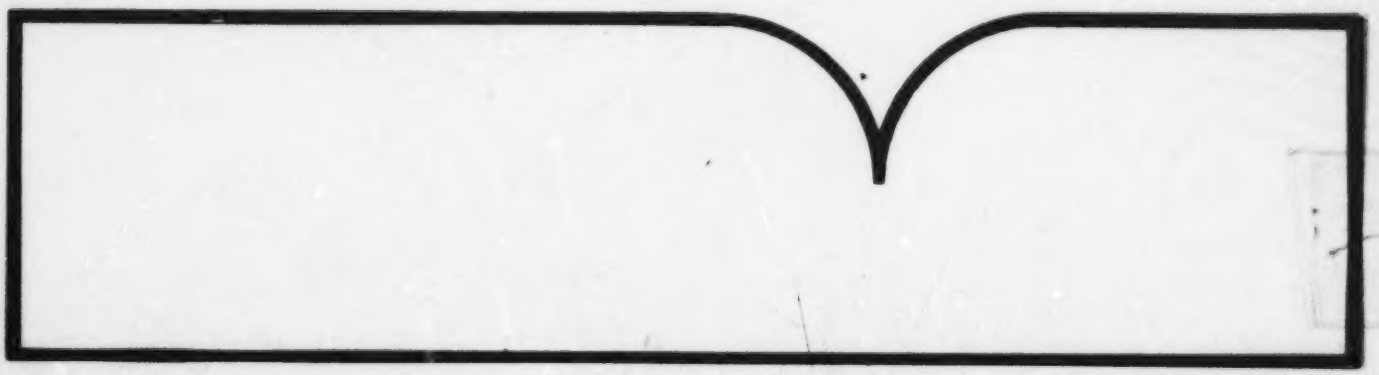
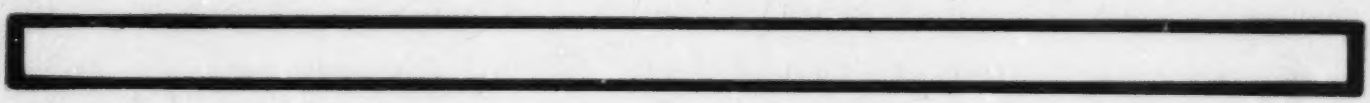
PB80-202336

Portable, Hand-Operated Cycle Sieve For Washing Macroinvertebrate Samples

(U.S.) Environmental Monitoring and Support Lab.-Cincinnati, OH

Jan 76





U.S. Department of Commerce
National Technical Information Service
NTIS.

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA-600/J-76-103	2. Journal Article	3. RECIPI PB80-202336
4. TITLE AND SUBTITLE Portable, Hand-Operated Cycle Sieve for Washing Macroinvertebrate Samples		5. REPORT DATE January 1976 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) William T. Mason, Jr.		8. PERFORMING ORGANIZATION REP RT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Environmental Monitoring and Support Lab., Cin, OH Office of Research and Development U.S. Environmental Protection Agency Cincinnati, OH 45268		10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO.
12. SPONSORING AGENCY NAME AND ADDRESS SAME		13. TYPE OF REPORT AND PERIOD COVERE 14. SPONSORING AGENCY CODE EPA-600/06

15. SUPPLEMENTARY NOTES
The Progressive Fish Culturist, Vol. 38, No. 1, January 1976, pages 30-32

16. ABSTRACT

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Grou
Invertebrates Sieves Washing Sampling Collecting Methods Aquatic Biology	Macroinvertebrates Grab Samples	06/C

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

18. DISTRIBUTION STATEMENT RELEASE TO PUBLIC	19. SECURITY CLASS *(This Report)* UNCLASSIFIED 20. SECURITY CLASS *(This page)* UNCLASSIFIED	21. NO. OF PAGES 3 22. PRICE

EPA Form 2220-1 (9-73)

EPA-600/J-76-103
JOURNAL ARTICLE

Portable, Hand-Operated Cycle Sieve For Washing Macroinvertebrate Samples

William T. Mason Jr.[1]

National Environmental Research Center
U.S. Environmental Protection Agency, Cincinnati, Ohio 45268

Methods for speeding the collection and analysis of macroinvertebrate samples are urgently needed to increase sampling precision and to reduce cost. Estimation of the number of individuals in a sample within ± 20% (P=0.05) of the true mean may require the collection of about 33 Surber square-foot samples (Diamond 1967), 40 Ponar bottom grabs (P.A. Lewis, W.T. Mason Jr., and C.I. Weber, unpublished manuscript), or three basket-type artificial substrate samples (Mason *et al.* 1973). Analysis cost may exceed $100 per sample. Since few institutions have enough manpower to process large numbers of samples, precision may be sacrificed. The "slurry" method for washing macroinvertebrate samples (American Public Health Association 1971; Weber 1973) is inefficient and may lead to errors in estimates of the benthic standing crop because the sieving technique varies with the operator. Metal soil sieves (U.S. Standard No. 30 sieve, 0.595-mm mesh openings, 5 cm deep, 21 cm in diameter) or their equivalents have neither sufficient screen surface area to prevent clogging, nor sufficient volume to accommodate the amount of material contained in most standard bottom grabs. Consequently, much time must be spent in the field sieving the samples. When the screen becomes clogged, backwash occurs and part of the sample may flush over the sides of the sieve. Since the first few slurries from a sample contain smaller particles than the last ones, both the sieving effort required and the retention of organisms approximating the sieve mesh size may vary, even within the same sample.

A stationary, electrically driven rotary sieve for shipboard use was described (Slack 1973), that standardizes sieving effort and reduces analysis time. However, the device is heavy and requires special plumbing, a stable platform, and a special energy source for operation.

The cycle sieve described in the present paper is practical for most freshwater work from small boats because it is light and portable, the major components are available commercially, and the parts are easily assembled. Because the samples are washed by hand at boatside, no special fixtures or energy sources are required. The entire sample is washed at one time, without risk of losing material, and the sieving effort is standardized.

In the cycle sieve (Figs. 1 and 2), a basket sample compartment is rotated underwater by a hand-operated

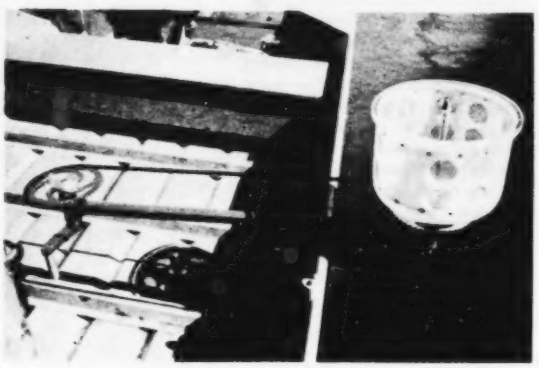


Fig. 1. Cycle sieve in the loading position.

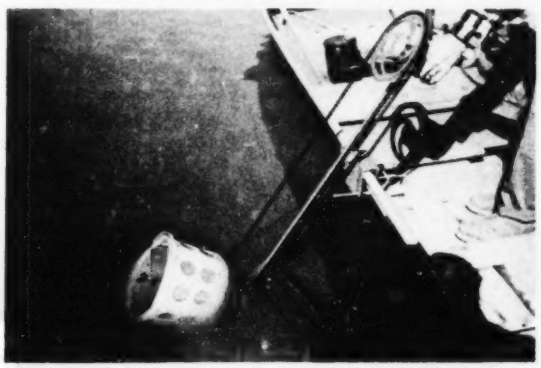


Fig. 2. Cycle sieve being lowered into the water.

[1] Present address: Water Quality Services, Interstate Commission on the Potomac River Basin, Suite 800, 4350 East West Highway, Bethesda, Md. 20014.

Description of parts of the cycle sampler, exploded view: (a) 3/8-in. stainless steel wingnut; (b) Plexiglas lid 11-3/4 x 5/8 in. with a 1/4-in. deep groove, 1/2 in. from the edge; (c) PVC bucket 8 in. high x 10-3/4 in. in diameter with 2-in. diameter portals (double row of 10) covered inside by stainless steel U.S. Standard No. 30 screen held in place by 1/8-in. aluminum pop rivets and silicone sealer, bottom with four screened portals 1 in. in diameter and a 5/8-in. center-drilled hole; (d) stainless steel shaft 5/8 in. in diameter x 15 in. long with 3/8-in. threads cut 1-1/4 in. from one end and set-screw depression 1/4 in. and 4-3/4 in. from the other end; (e) 1/8- x 1-1/4-in. flathead machine screws; (f) teflon spacer 1 x 3 in. in diameter with four equally spaced 3/16-in. holes placed 1 in. from the center and a center-drilled 7/8-in. hole; (g,w) machined brass hub 2-3/4 in. in diameter x 1/2 in. high with a 5/8-in. centered hole and a raised 3/4-in. flange with set screw; (h,v) 8-in.-diameter chrome-plated bicycle sprocket with 2, 3/16-in. holes placed 1 in. from the center; (i) 10-24 pan-head machine screws 2-1/4 in. long; (j,l,r,t) teflon spacer 3/8 in. high x 5/8-in. inner diameter; (k,s) 1-in. brass "T" bearing housing consisting of a 5/8-in. washer with four equally spaced holes for 3/8-in.-long 6-32 machine screws (not shown), a 5/8-in. neoprene "O" ring followed by a 5/8-in.-diameter x 3/4-in.-long bronze bearing, silver soldered into the end of the "T," with the same elements in reverse order at the opposite end of the "T" and the upper end of the "T" packed with grease; (m) 5/8-in. brass cap with set screw; (n) brass pipe 1-1/4 x 34 in. with 5/16-in. slot on both sides, and soldered brass plugs at both ends; (o) boat clamp with swivel pad screws 5/16 x 4 in.; (p) bracket for pipe with 1/4-in. beveled holes for set pin and holding pin and for two 1/4-in. flathead machine screws for securing bracket to boat clamp; (q) 7-in.-long handle with set screw and machined 3/8- x 4-in. dome headscrew for neoprene grip; (u) stainless steel shaft 5/8 x 5-3/4 in. with set pin depressions 1/2 in. from the handle end and 1 in. from the sprocket end; (x) 95-in.-long bicycle chain; (y) 1/4-in. stainless steel set pin with cotter pins; (z) 1/4-in. stainless steel stop pin with chain connecting it to the bracket.

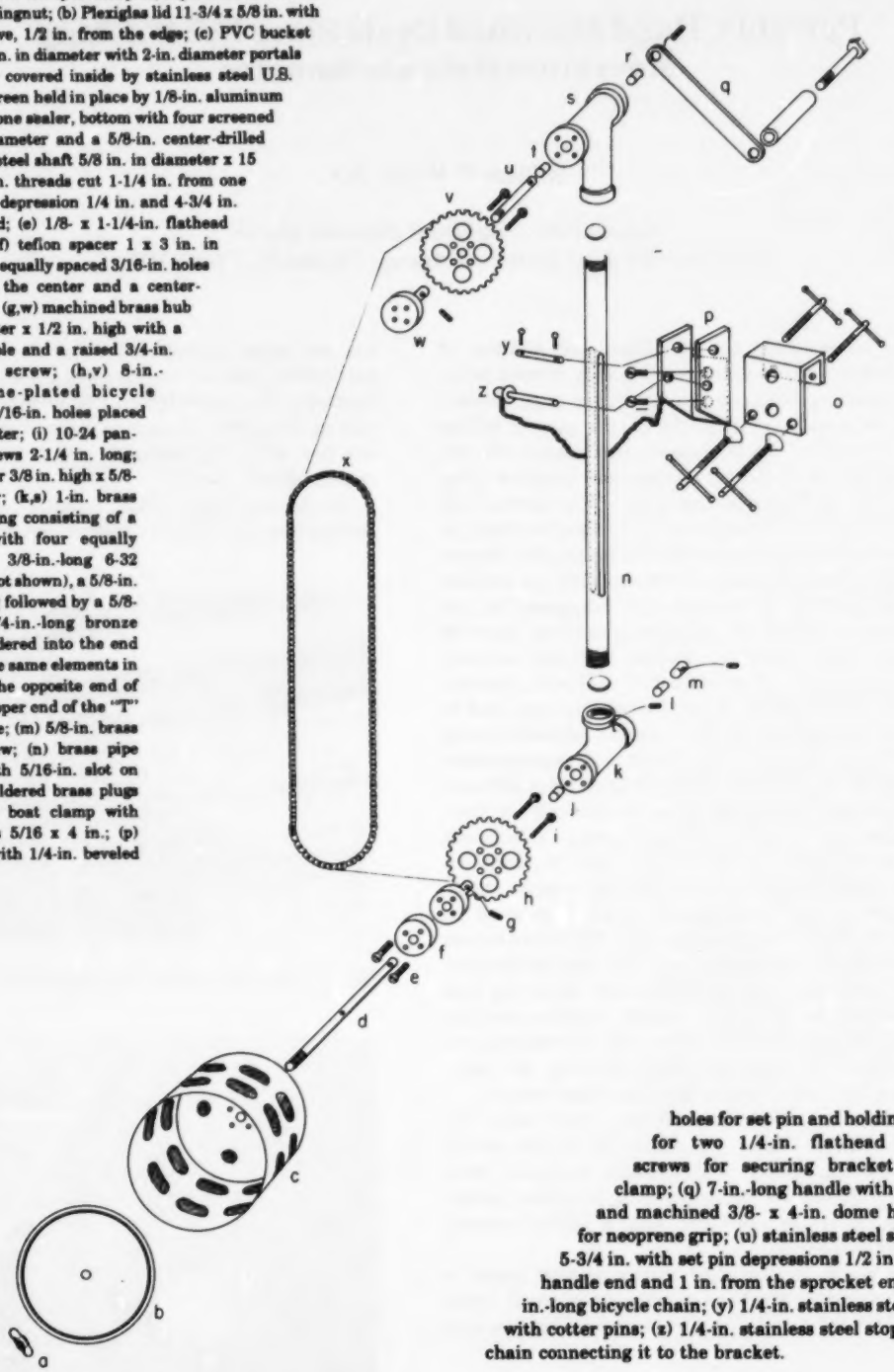


Fig. 3. Exploded view of cycle sieve.

sprocket-chain drive. The basket is made from the bottom half of a 5-gal polyvinylchloride (PVC) carboy with a double row of 10 screened portals (Fig. 3). Four portals in the bottom of the basket allow water to drain after washing. The basket is supplied with a Plexiglas lid for easy viewing during the washing process, and the lid has a deep groove that fits over the lip of the basket to prevent loss of organisms. The basket is attached to a bicycle sprocket mounted on bearings inside a "T"-joint pipe. This "T"-joint pipe is screwed onto a 34-in.-long pipe, 1¼ in. in diameter, with matched longitudinal slots two-thirds of its length that permit the basket-pipe assembly to slide easily up and down on a boat clamp. A removable set pin secures the basket in place while it is being loaded and unloaded.

In operation, the cycle sieve is secured in the position shown in Fig. 1 by the set pin and the basket lid is removed. The basket may either be left on the hub or removed (whichever is more convenient), the sample is placed inside, and the lid is replaced and secured to the hub by a wingnut. The handle is grasped by one hand while the set pin is removed with the other; the sieve then slides down into the water (Fig. 2) so that the pipe is perpendicular to the water surface. After sieving, the basket is brought to the surface and secured (Fig. 1) with the set pin, and the lid is removed for sample retrieval.

Basket rotations are counted (we use a 1:1 ratio) as the handle is cranked, and the basket is brought to the surface periodically to check on the progress of washing. When the minimum number of revolutions for complete washing is determined, the sieving effort is standardized for a series of samples.

Our experience indicates that a rotation speed of 60 cycles per minute with 8-in.-diameter sprockets effectively removes the fines in mud substrates within 3 min without damaging fragile organisms such as burrowing mayflies. Faster rotation does not appear to be advantageous since particles do not have enough contact time with the screen to pass through the mesh openings.

The cycle sieve basic design could be modified for adaptation to particular needs: the basket could be enlarged or reduced to accommodate different sample sizes, the gear ratio could be changed to reduce cranking effort, or several baskets could be arranged in tandem.

References

American Public Health Association. 1971. Standard methods for the examination of water and wastewater. 13th ed. New York, N.Y. 874 pp.

Diamond, J. 1967. Pesticides and stream insects. Bull. No. 23. Maine Forest Service, Augusta, and The Conservation Foundation, Washington, D.C. 21 pp.

Mason, W. T. Jr., C. I. Weber, P. A. Lewis, and E. C. Julian. 1973. Factors affecting the performance of basket and multiplate macroinvertebrate samplers. Freshwater Biol. 3(5):409-436.

Slack, H. D. 1972. A rotary sieve for removing mud from bottom deposit samples. Freshwater Biol. 2(2):159-162.

Weber, C. I. editor. 1973. Biological field and laboratory methods for measuring the quality of surface water and effluents. U.S. Environmental Protection Agency, Nat. Environ. Res. Cent., Cincinnati, Ohio. 205 pp.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1976—757-008/0011